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METHODS AND SYSTEMS FOR DELIVERING PRESENCE INFORMATION REGARDING PUSH-TO-TALK SUBSCRIBERS

Inventors: Richard Edward Schaedler, New Hill, North Carolina
Larry Gene Slate, _____, North Carolina
Aziz A. Tejani, Morrisville, North Carolina
Richard Nolan Kennedy, Jr., Naperville, Illinois

Assignee: Tekelec

Entity: Large Entity

JENKINS, WILSON & TAYLOR, P.A.
Suite 1400, University Tower
3100 Tower Boulevard
Durham, North Carolina 27707
Telephone: 919-493-8000
Facsimile: 919-419-0383

"Express Mail" mailing number EV 412 494 304 US
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Gayle W. Chaney
Gayle W. Chaney

Description

METHODS AND SYSTEMS FOR DELIVERING PRESENCE INFORMATION REGARDING PUSH-TO-TALK SUBSCRIBERS

Technical Field

The present invention includes methods and systems for delivering presence information. More particularly, the present invention relates to methods and systems for delivering presence information regarding push-to-talk subscribers.

Background Art

Real time communications systems, such as push-to-talk communications systems, require that members of a talk group know the status and location of other members of a talk group. In order for such a communication system to work effectively, the information regarding each member's status and availability must be delivered to other members in real time. For example, if a subscriber activates his or her push-to-talk handset and becomes available, it is necessary to immediately distribute this information to all of the other users in the talk group.

One protocol that may be used to communicate subscriber status and location information among members of a talk group is the presence protocol.

The presence protocol is described in IETF RFCs 2778 and 2779. According to the presence protocol, subscriber status information is stored in a database, referred to as a presence database. Other subscribers may subscribe to a first subscriber in the database. When the status of the first subscriber changes, the presence database sends notification messages to the other subscribers to notify the subscribers of the change in status. The other subscribers use this change in status to determine whether and where the first subscriber is available to receive communications.

One method for distributing presence protocol messages to mobile telecommunications network subscribers is to use short message service (SMS). SMS allows subscribers to send short text messages to each other via their mobile handsets. Subscribers can also send SMS messages to application servers, such as a presence, Push-to-Talk (PTT) or other server. SMS relies on short message service centers (SMSCs) to ensure that SMS messages are delivered. An SMSC stores SMS messages, locates destination subscribers, and forwards the SMS messages to the destination subscribers when they become available. SMSCs may reattempt delivery if a subscriber is initially unavailable.

One problem with using SMS to deliver presence information regarding push-to-talk subscribers is that presence information regarding push-to-talk subscribers loses its utility after a short time period. For example, if the intended recipient of an SMS message containing presence information regarding another subscriber is unavailable when the SMS message is initially generated, the SMSC stores the message and attempts re-delivery at a later

time. Using the store and forward mechanism currently provided by SMSCs wastes SMSC resources if the intended recipient of the presence information is unavailable and introduces latency in delivering presence information when the intended recipient is available. Accordingly, there exists a need for improved methods and systems for delivering presence information regarding push-to-talk subscribers.

Disclosure of the Invention

The present invention includes methods and systems for delivering presence information regarding push-to-talk subscribers in a manner that avoids latency introduced by short message service centers and that conserves short message service center resources. According to one method, an SMPP message is received at an SMS gateway. The SMS gateway determines whether the message contains presence information for real time delivery. If the message contains presence information for real time delivery and the subscriber is available, the message is delivered to the destination subscriber in a manner that bypasses the SMSC. If the subscriber is not available, the message may be discarded, since it loses its value after a short time period.

Accordingly, it is an object of the invention to provide methods and systems for delivering presence information regarding push-to-talk subscribers.

It is another object of the invention to provide improved methods and systems for delivering presence information regarding push-to-talk subscribers in a manner that bypasses SMSCs.

Some of the objects of the invention having been stated hereinabove, and which are addressed in whole or in part by the present invention, other objects will become evident as the description proceeds when taken in connection with the accompanying drawings as best described hereinbelow.

Brief Description of the Drawings

Preferred embodiments of the invention will now be explained with reference to the accompanying drawings of which:

Figure 1 is a network diagram illustrating an exemplary message flow for bypassing an SMSC in delivering presence information regarding a push-to-talk subscriber in an IS-41 network according to an embodiment of the present invention;

Figure 2 is a network diagram illustrating an exemplary message flow for delivering presence information regarding a push-to-talk subscriber in a GSM network according to an embodiment of the present invention;

Figure 3 is a block diagram illustrating an exemplary SMS gateway and a signal transfer point suitable for implementing the presence message delivery methods according to an embodiment of the present invention; and

Figure 4 is a flow chart illustrating exemplary steps performed by the SMS gateway in Figure 3 in delivering presence information regarding push-to-talk subscribers according to an embodiment of the present invention.

Detailed Description of the Invention

As stated above, the present invention delivers presence information regarding to push-to-talk subscribers in a manner that bypasses the SMSC and thus avoids latency and wasting of SMSC resources. Figure 1 is a network diagram illustrating an exemplary method for delivering presence information regarding a push-to-talk subscriber according to an embodiment of the present invention. Referring to Figure 1, a communications network may include a push-to-talk or presence server **100** that stores and maintains presence information regarding push-to-talk subscribers. An SMS gateway **101** provides an interface between local Short Message Peer-to-Peer (SMPP) network **102** of push-to-talk or presence server **100** and an SS7 network. Local SMPP network **102** may also include SMPP gateway **104** for sending and receiving SMPP messages and an SMSC **105** for delivering non-presence-based SMS messages. A signal transfer point **106** routes SS7 messages between SS7 network entities, such as HLR **108**, MSC **110**, and BSC **112**, and SMS gateway **101**.

Although in the example illustrated in Figure 1, presence server **100** is connected to network **102** via SMPP gateway **104**, the present invention is not limited to such a configuration. In an alternate configuration, presence server **100** may be directly connected to network **102** without going through an SMPP gateway. The same applies for the example described below with regard to Figure 2.

In the illustrated example, when presence status regarding a push-to-talk subscriber changes, push-to-talk or presence server **100** sends the updated

information to SMPP gateway **104**. SMPP gateway **104** formulates an SMPP request message including the presence information. The SMPP request message is forwarded to SMS gateway **101** via local SMPP IP network **102**. In response to the SMPP request message, SMS gateway **101** formulates an SMS request message with a TCAP origination transaction ID that identifies SMS gateway **101** and forwards the message to STP **106**. STP **106** performs a lookup based on the MSISDN number in the SMS request message and forwards the SMS request message to the appropriate HLR **108**. HLR **108** determines the location of the destination subscriber **114** and formulates an SMS acknowledgement message containing the location information, including the ID of MSC **110** in which subscriber **114** is currently available. The SMS acknowledgement message may also include a transaction identifier for identifying the SMS transaction. HLR **108** forwards the acknowledgement message via STP **106** to SMS gateway **101**.

In response to receiving the SMS acknowledgment message including the MSC and destination transaction IDs, SMS gateway **101** formulates an SMS Delivery Point-to-Point (SMDPP) request message for sending the presence information to the subscriber. SMS gateway **101** forwards the SMDPP request message to MSC **110**. MSC **110** sends the request message to BSC **112**. BSC **112** forwards the SMDPP request message to handset **114** to deliver the presence information to the handset. In response to the SMDPP request, handset **114** sends an SMDPP response with the TCAP destination transaction ID set to identify SMS gateway **101**. Thus, using the steps

illustrated in Figure 1, presence information regarding a push-to-talk subscriber can be delivered using SMS in a manner that by passes the SMSC.

In addition to delivering presence information to subscribers using SMS messages, SMS gateway **101** may also deliver presence information using alternate message protocols, such as the unstructured supplementary services data (USSD) protocol. Figure 2 is a network diagram illustrating an exemplary message flow for delivering presence information to handset **114** using the USSD protocol. In Figure 2, SMS gateway **101** may determine the USSD compatibility of handset **114** by intercepting messages exchanged between HLR **108** and VLR **116** when subscriber handset **114** changes locations. Such message interception may be performed by message copy and MAP screening functions within STP **106** or by a signaling link probe external to STP **106**. Alternatively, SMS gateway **101** may be provisioned with data that indicates the USSD capabilities of mobile handsets.

In order to deliver presence information to handset **114**, PTT or presence server **100** generates presence information and forwards the presence information to SMPP gateway **104**. SMPP gateway **104** formulates an SMPP request message including the presence information and sends the SMPP request message to SMS gateway **101**. SMS gateway **101** determines that the subscriber is USSD compatible and available. Accordingly, SMS gateway **101** sends an SRI_for_short_message message to STP **106**. STP **106** performs a lookup based on the MSISDN number in the SRI message and determines that the message is destined for HLR **108**. Accordingly, STP **106**

forwards the SRI message to HLR **108**. HLR **108** sends a response containing the MSC and destination transaction ID to SMS gateway **101** via STP **106**.

In response to receiving the MSC information, SMS gateway **101** formulates a USSD request with a TCAP origination transaction that identifies SMS gateway **101** and forwards the USSD request to MSC **110** via STP **106**. MSC **110** sends the USSD request to handset **114** via BSC **112**. Handset **114** formulates a USSD response and sends the USSD response to SMS gateway **101** via BSC **112**, MSC **110**, and STP **106**. The TCAP destination transaction ID in the response is set to identify SMS gateway **101**. SMS gateway **101** terminates the USSD response. SMS gateway **101** then sends and SMPP response back to PTT or presence server **100**.

Figure 3 is a block diagram illustrating an exemplary STP **106** and SMS gateway **101** suitable for implementing presence information delivery according to an embodiment of the present invention. Referring to Figure 3, STP **106** includes a distributed internal processing architecture in which a plurality of modules or processor cards are connected to each other and communicate via a counter-rotating, dual-ring bus. In the illustrated example, the modules or processor card include an SS7 link interface module (LIM) **300**, a data communications module (DCM) **302**, and database services modules (DSMs) **304**. Modules **300**, **302**, and **304** are connected via buses **308**. In an alternate configuration, modules **300**, **302**, and **304** may be connected via a switch, such as an Ethernet switch.

Link interface module **300** includes functionality for sending and receiving messages over an SS7 network. In the illustrated example, link

interface module **300** includes a message transfer part (MTP) layer 1 and 2 function **310**, a gateway screening function **312**, a discrimination function **314**, a distribution function **316**, and a routing function **318**. MTP level 1 and 2 function **310** performs SS7 MTP level 1 and 2 operations, such as error detection, error correction, and sequencing. Gateway screening function **312** screens messages to determine whether to allow the messages into the network managed by signal transfer point **106**. The screening may be performed based on the destination point code or any other MTP 3 layer parameters in the message. Discrimination function **314** examines the destination point code in a message to determine whether the message is addressed to STP **106** or to an external node. If the message is addressed to STP **106**, discrimination function **314** passes the message to distribution function **316**. Distribution function **316** distributes the message to one of the other processing modules in STP **106** via buses **308**. If the message is destined for an external node, discrimination function **314** passes the message to routing function **318**. Routing function **318** performs MTP 3 routing based on the destination point code in the message. Once routing function **318** locates the outbound linkset associated with the destination point code, routing function **318** routes the message to the card or module associated with the outbound signaling link via bus **308**.

DCM **302** includes functionality for sending and receiving SS7 messages over IP networks. In the illustrated example, DCM **302** includes an SS7/IP gateway function **320**, a gateway screening function **312**, a discrimination

function **314**, a distribution function **316**, and a routing function **318**. SS7/IP gateway function **320** performs the operations necessary to send and receive SS7 messages over IP networks. For example, SS7/IP gateway function **320** may implement TCP/IP, SCTP/IP, or UDP/IP as the underlying transport and network layers. In addition, SS7/IP gateway function may implement one or more SS7 adaptation layers, such as M3UA, SUA, M2PA, or Tekelec's Transport Adapter Layer Interface, to carry SS7 traffic. Gateway screening function **312**, discrimination function **314**, distribution function **316**, and routing function **318** perform the same functions as the correspondingly numbered components described with regard to LIM **300**.

Database services module **304** include functions for performing database services for SS7 messages identified as requiring internal processing by signal transfer point **106**. In the illustrated example, each database services module includes a signaling connection routing controller **322**, a MAP screening function **323**, a global title translation function **324**, and a routing function **318**. Signaling connection routing controller **322** receives signaling connection control part (SCCP) messages sent from LIM **300** or DCM **302** via bus **308** and determines the type of SCCP processing that should be performed for the messages. One type of SCCP processing that may be performed is global title translation. Accordingly, SCRC **322** may call or invoke global title translation function **324** to perform global title translation for SCCP messages that are sent route on global title. After global title translation is performed, global title translation function **324** may forward the messages to routing function **318**, where the messages are routed to the interface module

associated with the outbound signaling link. MAP screening function **323** may screen and copy MAP messages relating to changes in location of mobile subscribers and forward copies of these messages to SMS gateway **101**. SMS gateway **101** may utilize information extracted from these messages to determine whether subscribers are USSD-capable.

SMS gateway **101** may be connected to signal transfer point **106** via SS7 signaling links, IP signaling links, or a direction connection to bus **308**. In the illustrated example, SMS gateway **101** is connected to STP **106** via SS7 signaling links. However, any suitable method for interconnecting STP **106** and SMS gateway **101** is intended to be within the scope of the invention.

SMS gateway **101** includes functionality for sending and receiving SMPP messages, SS7 messages, and USSD messages relating to the delivery of presence information. For example, SMS gateway **101** may include an SS7 interface **326**, a MAP interface **328**, an SMPP interface **330**, a USSD interface **332**, a short message gateway function **334** and databases **336**. SS7 interface **326** implements SS7 MTP layers 1-3 for communicating with STP **106** via SS7 signaling links. MAP interface **328** terminates MAP protocol messages relating to SMS. SMPP interface **330** terminates SMPP messages relating to the delivery of short messages. USSD interface **332** implements the USSD protocol to send and receive messages to mobile handsets without using SMS. Short message gateway function **334** controls the overall operation of SMS gateway **101**. In addition, short message gateway function **334** may perform

lookups in one or more databases **336** in order to properly route SMS control messages.

Short message gateway function **334** may perform the operations described above for delivering presence information to mobile subscribers in a manner that bypasses the SMSC. Figure 4 is a flow chart that illustrates exemplary steps that may be performed by short message gateway function **334** in delivering presence information relating to push-to-talk subscribers. Referring to Figure 4, in step **400**, short message gateway function **334** receives presence information from a presence or push-to-talk server. In step **402**, short message gateway function **334** determines whether the intended recipient is available. This step may be performed by querying the HLR as illustrated in Figures 1 and 2. If the subscriber is not available, control proceeds to step **406** where the message is discarded. In addition to or instead of discarding the message, short message gateway function **334** may send a notification to the presence or push-to-talk server indicating that the intended recipient is unavailable.

In conventional SMS delivery methods, the short message intended for a mobile subscriber would be stored until the subscriber became available. This is undesirable for SMS-based presence messages regarding push-to-talk subscribers, since presence information regarding push-to-talk subscribers loses its utility for contacting a subscriber after a short time period. The present invention avoids this difficulty by only attempting to deliver messages if the intended recipient is available, thereby avoiding latency and unnecessary wasting of SMSC resources.

In step **404**, if the recipient is available, control proceeds to step **408** where short message gateway function **334** determines whether the recipient is USSD-capable. Determining whether the recipient is USSD-capable may include intercepting messages passed between HLR **108** and VLR **116** to determine whether the recipient handset has USSD capabilities. Alternatively, SMS gateway **101** may be provisioned with information as to whether subscribers are USSD-capable. In step **410**, if the recipient handset is USSD-capable, control proceeds to step **412** where the message is delivered using USSD. Delivering the message using USSD bypasses the SMSC, since USSD is session oriented, rather than store and forward oriented.

In step **410**, if the recipient is not USSD-capable, control proceeds to step **414** where the message is delivered using SMS in a manner that bypasses the SMSC. For example, as illustrated in Figure 1, the short message gateway may determine the location of the recipient and send the presence information directly to the recipient.

Thus, the present invention includes methods and systems for delivering presence information regarding push-to-talk subscribers. The messages are delivered in a manner that avoids the store and forward mechanism of conventional SMS message delivery. Using a short message gateway, the present invention bypasses SMSCs and allows messages to be delivered directly to the subscriber. Accordingly, latency and wasting of SMSC resources are reduced.

It will be understood that various details of the invention may be changed without departing from the scope of the invention. Furthermore, the

foregoing description is for the purpose of illustration only, and not for the purpose of limitation, as the invention is defined by the claims as set forth hereinafter.